Soft Starter User Manual

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Safety Clauses

In the process of using the soft starter, please note the following Safety Clauses

⚠ Please check this user manual carefully before using the product.

⚠ Only the technical person is allowed to install the product.

⚠ To be sure that the motor is correctly matched with the soft starter.

⚠ It is forbid to connect capacitors to the output terminals （U V W）.

⚠ Please seal the terminal switch insulation glue after finishing connect them.

⚠ The soft starter and its enclosures must be fixedly earthed.

⚠ During the maintenance and repair, the input must be power.

1. The General of FWI-SS Series Soft Starter

FWI-SS series Soft Starter is new type start-up equipment which integrates electric force and electron techniques computer technique and modern control theory. It is the new generation product to replace the conventional Star-delta Starter, Self-coupling voltage-drop Starter and Magnetic control voltage-drop Starter.

1.1 The main function

●This Motor Soft Starter can reduce the starting current of Motor and the power-distribution capacity to Motor effectively, so it could save the cost.

●It can reduce the starting stress of motor and other loading equipments, so that lengthen their service life.

●The function of soft stopping can solve effectively the surging problem of inertia system when stopping. The conventional motor starting equipments can not realize it.

●The perfect and reliable protection features, can give the effective protection to the operator's safety as well as the motor and matched equipments.

●The application of intelligent and network technique make the FWI-SS type Soft Starter meet the high -speed development of Electrical force automated technique effectively.

1.2 The main characteristics

Perfect design

Pretty external shape and structure, perfect and unique functions, simple and

reliable operation, every technological is made in the best design.

Reliable and high-grade quality

This product is designed according to the computer analog test, has the best electromagnetic compatibility. It is proved high quality by the high-temperature ageing test and jigging test which done before the products out of factory.

Complete and perfect protection functions

Such as offset voltage protection, failure voltage protection, over voltage protection, Motor overheat or starting time over long protection, input or output failure phase and three-phase unbalanced protection, over current, over load and short current protection, unbalanced protection, over current, over load and short current protection.

Having the decision-making intellectual property of the product

Including exterior designing patent, decision-making software copyright, the starting and protection techniques of Motor, and the technology of detecting and debugging

The best service

The reliable function and quality is the basic of the best service. Even more, we can supply the special designing and functions of product matched to your need and the timely and perfect usage consulting service.

2. Code explanation and Check-up before using

Please check up the products before using, if in some problems; please do not hesitate to contact us with any request for additional information. Check-up the type of product whether it is the right one you order

FWI-SS series Motor Soft Starter	
Code	FWI-SS3 -5d5-4
Input voltage	3-phase AC460V 60Hz
Matched motor	5.5KW
Ex-factory code	
Date of produce	
Company Name	

● Check any damage to the product because of the transport, such as the spare parts are apart from the main body or the shell be damage etc.

● Check others, including the Certificate of Soundness, and the User Manual.

3. Usage condition and installation requirement

It is strict rule for the users to use or install the soft starter according to the requirement; otherwise, it will be in bad result.

3.1 The usage condition

Power Supply: City power, self-provided power, diesel oil dynamotor, 3-phase alternating current 380V, 480V or 660V±10%, 50Hz or 60Hz.The power capacity to the soft start must meet the motor starting requirement.

Motor Matched: squirrel-case asynchronous motor whose power is matched with the soft starter

Starting Frequency: The starting time is according to the loading equipments

Cooling Mode: Naturally wind cooling

Protective Grade: IP20

Environment Conditions: when altitude is less than 2000m, the temperature of the environment should be between -25～ 40, relative humidity should be less than 90%, no vapor, no flammable, volatile, corrosive gas. No electric dirt, indoor installation, ventilated, vibration is less that 0.5G. Note: Over more, we can manufacture other type soft starters which are used in special conditions, such as

explosion-proof type soft starter, low-temperature type soft starter, or high-voltage type soft starter.

3.2 The installation requirement

● The direction and distance of installation: In order to make sure that the soft starter be in good draft and heat dissipation, please install the product in vertical direction, and be sure the spare around the product is enough.

(See the following diagram 3.1 and 3.2)

● If the soft starter is installed in a box, please note that the draft is very good, as well as the above notes.

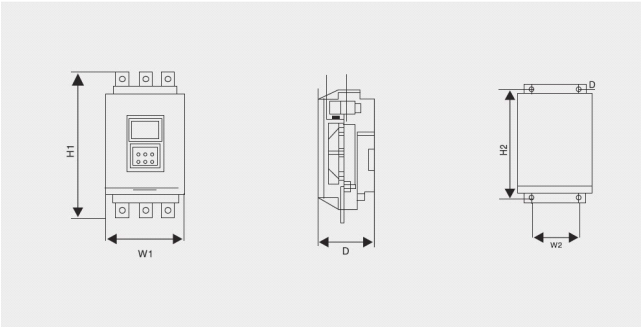
(See the following diagram 3.3)

3.3 The Installation Dimensions

The External shape and installation dimensions of 5.5KW-55KW

Specifications	Power (KW)	External shape dimensions(mm)			Installation dimensions(mm)			NW (kg)
		W1	H1	D	W2	H2	d	
FWI-SS3-5d5	5.5	143	270	160	129	247	M6	＜3.5
FWI-SS3-7d5	7.5	143	270	160	129	247	M6	＜3.5
FWI-SS3-011	11	143	270	160	129	247	M6	＜3.5
FWI-SS3-015	15	143	270	160	129	247	M6	＜3.5
FWI-SS3-018	18.5	143	270	160	129	247	M6	＜3.5
FWI-SS3-022	22	143	270	160	129	247	M6	＜3.5
FWI-SS3-030	30	143	270	160	129	247	M6	＜3.5
FWI-SS3-037	37	143	270	160	129	247	M6	＜3.5
FWI-SS3-045	45	143	270	160	129	247	M6	＜3.5
FWI-SS3-055	55	143	270	160	129	247	M6	＜3.5

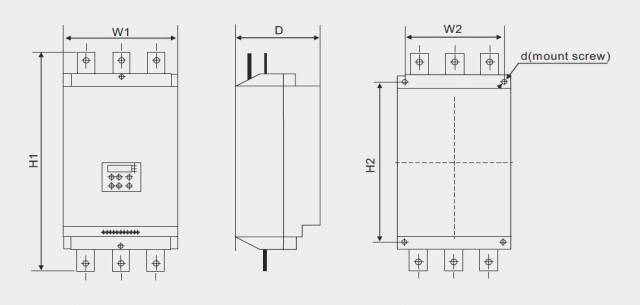
Note: The rated power of motor in the above form is the maximum rated value. generally, the values of matched motor should not be more than this value.



The External shape and installation dimensions of 75KW-560KW

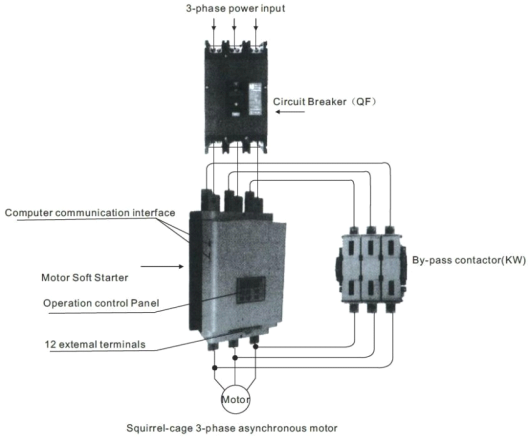
Specifications	Power (KW)	External shape dimensions(mm)			Installation dimensions(mm)			NW
		W1	H1	D	W2	H2	d	(kg)
FWI-SS3-075	75	260	470	200	230	440	M8	＜20
FWI-SS3-090	90	260	470	200	230	440	M8	＜20
FWI-SS3-115	115	260	470	200	230	440	M8	＜20
FWI-SS3-132	132	260	470	200	230	440	M8	＜20
FWI-SS3-160	160	260	470	200	230	440	M8	＜20
FWI-SS3-185	185	260	470	200	230	440	M8	＜20
FWI-SS3-200	200	260	470	200	230	440	M8	＜20
FWI-SS3-250	250	290	500	200	260	470	M8	＜20
FWI-SS3-280	280	290	500	200	260	470	M8	＜20
FWI-SS3-320	320	290	500	200	260	470	M8	＜20
FWI-SS3-400	400	400	555	200	370	525	M8	＜20

FWI-SS3-450	450	400	555	200	370	525	M8	＜20
FWI-SS3-500	500	400	555	200	370	525	M8	＜20
FWI-SS3-560	560	400	555	200	370	525	M8	＜20



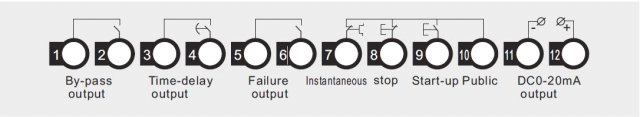
The FWI-SS Soft Starter has three types of connection, as following Main circuit connection: it contains the wiring of 3-phase source input, the output to motor, and the pass -by contactor connection. External terminal connection that is the wire comes from twelve external terminals which including control signal and analogue output signal. Communication connection, there are two communication interfaces; those are RJ-45 standard web line socket and Db6socket which are connected to computer.

4.1 The diagram connection (see the diagram 4.1)



4.2 The external terminal

Please see the diagram 4.2



● Terminal ① ② are by-pass output, are used to control the by-pass contactor. They are normal open contacts and are closed when finishing starting. The contact capacity is Ac250V/5A

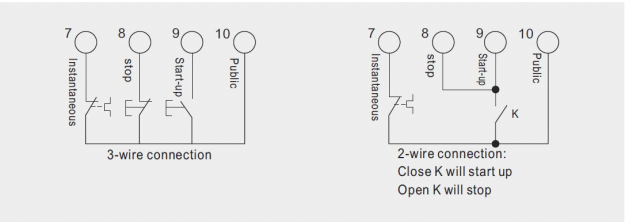
● Terminal ③ ④ are programmable relay output: it is set by FJ code .They are normal open no-power contacts Please see the detailed information in 5.3 item. The contact capacity is AC250V/5A

● Terminal ⑤ ⑥ are fault output , they will be closed when there are any fault matters happened to the soft starter or loose electricity, while at normal case they are open. The contact Capacity is AC25V/0.3A

● Terminal ⑦ are Instantaneous stop input, this terminal must be connected with terminal ⑩ when the starter works normally. But if these two terminals are both open, the soft starter will stop, and at this time the starter is at the state of fault protection. Terminal⑦can be controlled by the output contact of external protection dives, and it is useless when the F12Key is set as 0(basic protection).

● Terminal ⑧ ⑨ ⑩ are start-up or stop input .There two ways of connections for your choose, those are 3-wire connection and 2-wire connection.

● Please see the diagram 4.3

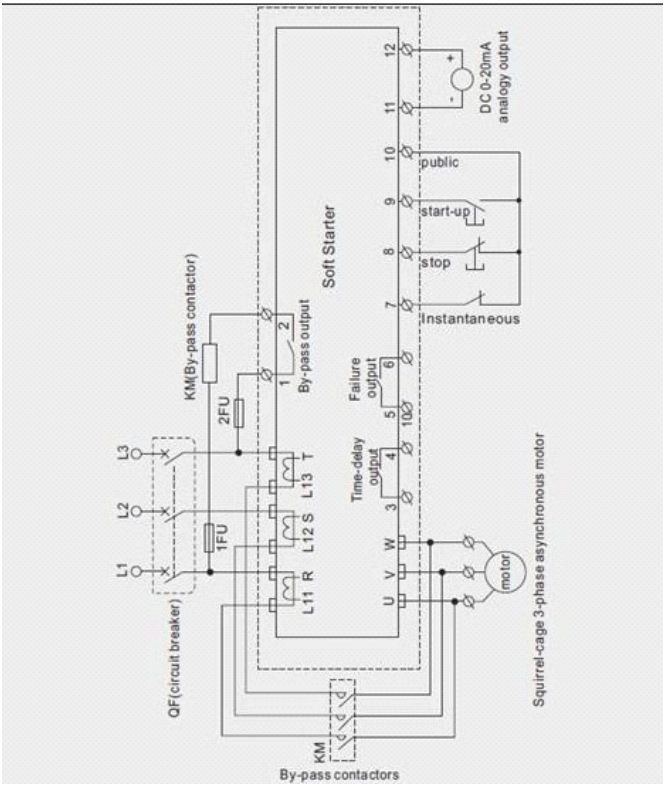


Terminal ⑾ ⑿ are DC 0-20mA analogue output ,they show the current value of motor when real-time working, 20mA is full-scale value and is four times than rated current of nominal power of soft starter, while, we can contact a 0-20mADC current meter to check. The Max value of output load resistance is 300Ω

Note: Please make sure that external terminals are in right connection; otherwise, the product may be damaged.

4.3 The diagram of Main circuit connection

Please see the diagram 4.4

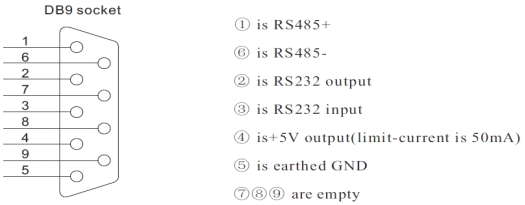


4.4 The communication interfaces

RJ-45 is the standard web line socket

DB9 socket has Rs485 and RS232 interfaces inside

Please see the diagram 4.5



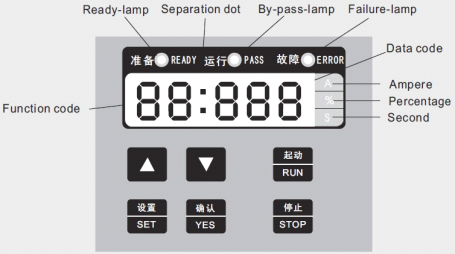
1. Computer collector distribution control communication software
2. Device Net interface card and communication software
3. Device Net/Mod-bus/ Profi-bus gateways
4. Others

5. Control Panel and its operation

There are five working states of soft starter, those are: Ready, Run, Fault, Start and Stop. The control panel will show the current vault of motor when in the process of start or stop, and it will show the set and help menu at other states.

5.1 The operation of control panel

Please see the diagram 5.1



- Open state: you should not press the "run" key until the ready-lamp lights and show “READY"

- Time-delay state: When the ready-lamp or fault-lamp is shining, it means it is interval time delay; and when the Display screen shows "dEXXX", means staring time-delay.

- The "Run" or "Stop" key: In the process of staring, the panel shows "XXXX" that is the value of start-up current .At this time only "Stop" key is in use. And the lamps of ready, run and fault are all dark, and you can not come into the "set" and "help menu" state. While, in the process of stopping, the panel shows "XXXX" that is the value of start-up current. At this time, only "Run" key is in use, and the lamps of ready, run and fault are all dark, and you can not come into the "set" and "help menu” state.

- The "Set" key: Press "Set" key to come into the Set Menu and now the panel is showing FX: XXX. Please press "Set" key again and Colon is shining, then you can change the Parameters under the Colon you need If you want to keep the Parameters changed, Please press "Yes" key, and if you do nor want, please pressing the "Set" key until the Colon stops shining, then the Parameters are former .Having finished the above operation, please press the "Yes" key to return or "Stop" key to return directly

- The "Yes" key: Press the "Yes" key directly; you will come into Help Menu and the panel shows HX: XXX. When you finish reading the Help Menu, you can press this key again or "Stop" key to return. This key not only can be used to keep the Parameters when you set the parameters you need, but also be sued as "Returning".

● The "Up" and "Down" ("▲"" ▲ ") key :In the Set Menu ,you can press these two keys to choose the Function Code you need when the Colon is not shining and can choose the Parameters under the Colon when Colon is shining ,It is the same as the operation in Help Menu. When the Pass-by -lamp is lighting and the Display Screen shows AXXX which means the operation current value of motor, now you can press "Up" or "Down" key and the Screen will PXXXX or HXXXX i n t u n (P X XXX means the apparent power of motor; HXXXX means the over-load heat balance coefficient, if this value is more than 100%, the Screen shows "Err06", that means it is at that state of over-load protection.)

Note: 1. only the operation is correct, it will be with the voice when pressing the key. Otherwise, the operation is wrong.

● the control panel uses the super anti-interference material, so it can be state of 3 meters away.

5.2 Parameters set and explanation

The explanation for "Parameter-set "codes

Code	Explanation for codes	The range of value	Ex-factory value	Special explanation
F0	This code is used to set the “voltage value”	30-70%	30%	This code can be used when the starting mode is set as “Ramp voltage to start,” and if is “Limit-current” mode ,the value will be fixed as 40%
F1	This code is used to set the “soft starting	2-60S	16S	It is invalid in“ Limit-Current” starting mode.

	time”			
F2	This code is used to set the “soft starting time”	0-60S	0S	If the code is set as “0”,the motor will “staring mode”
F3	This code is used to set the time of“ start-up time delay”	0-999S	0S	By the count-down way, If set as “0”, the starter will start up the motor Immediately without time-delay.
F4	This code is used to time of “programming output time-delay”	0-999S	0S	Be used with” programming relay output”
F5	This code is used to set the “Interval start time-delay”	0-999S	0S	Be used when you need or have to Re-start the motor for several times, or Re-start the motor after removing the over-heat protection for motor.
F6	This code is used to set the “start-up limit current value”	50-500%	280%	It is used when the staring mode is “Limit-current”, and the value will be fixed as 400% when the starting mode is” Ramp voltage to start”

F7	This code is used to set the “maximum working current of soft starter”	50-200%	100%	The “50-200%”is basic on the nominal current of motor. If the set value of this code over 200%,the soft starter will be “inverse time heat protection”
F8	This code is used to set the” the modes of input display”	0-3	1	Set the detailed in Item 5.5
F9	This code is used to set the” the under-voltage protection”	40-90%	80%	When the working voltage is under the value range(40%),the soft starter will be in under-voltage protection
FA	This code is used to set the “the under-voltage protection”	100-140%	120%	When the working voltage is under the value range(90%),the soft starter will be in under-voltage protection
FB	This code is used to set the” modes of starting”	0-5	1	0:Limi-current to start 1:Ramp voltage to start 2:Torque control + limit current 3:Torque control + Ramp voltage 4:Ramp current to start 5:Double closed loop
FE	This code is used to set	0-13	0	Set the detailed in Item 5.4

	the “time of re-start”			
FF	This code is used to set the “parameter change”	0-2	1	Set the detailed in Item 5.5
FH	This code is used to set the” communication address”	0-63	0	
FJ	This code is used to set the” programming output”	0-19	7	Set the detailed in Item 5.3
FL	This code is used to set the “soft-stopping limit current value”	20-100%	80%	Set the detailed in Item 7.3
FP	This code is used to set the” rated current-of Motor”		Rated value	“The rated current of motor” is the same as the current nominal current of motor
FU	This code is used to set the “motor under-load protection”		Prohibition	Set the detailed in Item 5.5

Note:

● F7 the "Max working current", is basic on the nominal current of motor.

● If you have no any operation for 2 Minutes after you come into the "set" state, you will return from "set" state.

● You can not set any parameters in the process of starting or stopping.

● If you press the "Yes" key to open the soft starter, you can make the set parameters recovery to Ex-factory values.

5.3 The function of "Programmable relay output"

This function has two kinds of operation way, those are Programmable time sequence output and output and Programmable state output.

● When the FJ is set as 0-4(or 10-14), the programmable operation way is time sequence output, As the following form:

The number set by FJ	0(10)	1(11)	2(12)	3(13)	4(14)
The moment for Program output	When sending the or der of " starting" ,the program output	When beginning to start,the program output	When at the start of by pass operation,the program output	When sending the order of "stopping" the program output	When finishing the operation of stopping the put

If need programmable relay output time-delay, the delay time is set by F4 code.

●When the FJ is set as 5-9(or 15-19), the programmable operation way is time sequence output, As the following form:

The number set by FJ	5(15)	6(16)	7(17)	8(18)	9(19)
The "output state" showed	Error state	Operation state	Ready state	Starting state	By-pass operation state

● The way of programmable state output is used to show the working state of soft state, and under this way, the F4 code is un-useful; The ex-factory value of FJ code is "7"showing the ready state of soft starter and at this time the motor can be started up; when the programmable output is in fault state, the faults m＞＞mean the fault of motor, such as fault of Err05, Err06, Err12, Err15,and they are different form the faults come from the terminals⑤⑥ output.

● When FJ＞9,the reset state of programmable output is normal closed ,that is" inverse phase output"

5.4 The function of Re-start

When the FE item is not set as "0", the Automatic Re-start function is in use. This function is affective only the External Control connection is 2-wire way and is not controlled by the FD item (External Control allowed). When it is 2-wire way you can:

● Having got electricity and delay time for 60 seconds, the soft starter will Re-start automatically.

● Having stopped because of any fault and delay time for 60 seconds, the soft starter will Re-start automatically

● the total number of times of automatic re-start is "n" times,"n" is set by FE item.

● the function of automatic re-start is effect only when getting electricity and

opening again

● The soft starter has the protection function of under-voltage ,so when the electricity be cut off and then get on again ,the soft starter will not Re-start no matter which state the control terminals at, in case of the danger to operator. But if the Automatic Re-start is allowed, the Protection function of under-voltage is no use.

5.5 Directions for other set items

You can use F8 item choose the Input way and Display Way.

As the following form (Form 5.2)

Numerical Value of F8 item	0	1	2	3
Input Way (F6 F7)	Input Current Value	Input Percent-age	Input Current Value	Input Percent-age
Running Display Way	Display Current Value	Display Current Value	Display Percentage	Display Percentage

Note: If the F6, F7 items input the percentage numerical value, the percentage is the current Percentage set by FP item FD item used to set the control ways of soft starter

As the following form (Form 5.3)

Numerical value	0	1	2	3	4	5	6	7
keyboard	1	1	0	0	1	1	0	0
External control	0	1	1	1	1	0	0	0
Communication	0	0	0	1	1	1	1	0

Note: In the above form,"1"is allowing,"0"is forbidding. For e example, if you forbid any unexpected stopping or starting whether starting is running or in maintenance, you can set the Numerical Value as"7"which means forbidding any starting or stopping operation. If the "External Control" is used, you must contact a NC button

switch between the terminal ⑧ and terminal ⑩, otherwise, the soft starter can not start-up the motor.

● FJ item is used to set the starting time of output of the Programmable relay As the following form (Form 5.4)

The Numerical Value of FJ item	0	1	2	3	4	5	6	7
Starting time of output of the Prgrammable relay	Sending out the order of starting	Starting	Pass-by	Sending out the order of starting	Finish stopping	Instantan-eous stop	Fault happens	Finish re-start

5.6 Help message and explanation

When the product is not starting or stopping ,or not at the "set" state, you can press "Yes" key and come into Help menu ,then press the "Up" or "Down" key to choose the help message. Please press "Yes" or "Stop" key to return.

Help message Form

Message displayed	Explanation
AC380	That is the 3-phase power voltage is AC 380V
05.5-3	That is the Specification is AC380V, 60Hz, 5.5KW
H1:E05	The fault message Err05 that happened at the last time
:	:
H9:E00	It says no fault happened
Uer1.5	It says the software of the product is Ver1.5-6.5
Note: The message H1-----H9 displayed means 9 faults kept that happened lately.	

6. Protection Functions and theirs explanation

We make our soft starters have all kinds of protection functions to protect the soft starter and the motor using. Please choose the correct Protection class and parameters according to your usage conditions!

Over-heat Protection：when the temperature inside soft starter is up to 80℃±5℃,the starter will be into Over-heat protection, when be down to 55℃,this

protection removes.

○ Input failure-phrase protection: the delayed time＜3s

○ Output failure-phrase protection: the delayed time＜3s

○ Three-phrase unbalanced protection: the delayed time＜3s,when the different current value among three phrases is more than 50%±10%,the protection be used.

○ Starting over-current protection: the diagram 6.1 shows the protection time when the Current is more 5 times than the rated working current.

○ Working over-load protection: the starter will be in inverse time thermal protection on
Base of the Max working current of motor (Set by F6 Item), (The diagram 6.1 s how)

○ Power voltage failure protection: the delayed time is separately less than 0.5s or 3s when
the power voltage is less than half of limited value or less than the set value.

○ Over-voltage protection: the delayed time is separately less than 0.5s or 3s when the power voltage is move than 130% if limited value or more than the set value.

○ Loading short-current protection: when the current is more 10 time than the motor rated current, it will be short current, and then be in short-current protection, the time is less than 0.1s.

○ The time parameters above is from the time receiving the message to the time sending out the protection message. They are for reference only. If you need any

other protection functions, please contact with us!

6.2 Protection classes and explanation

According different usage conditions, GJR8 Soft Starter has five protection classes, as following:

a. basic protection

b. light-load protection

c. standard protection

d. heavy-load protection

e. the best protection

● Basic protection includes the protection functions of over-heat, short -current protection and input failure-phrase protection when starting, but no protection of internal connector instantaneous-shop. we can se he protection glade when the motor is no need to be stopped urgently, such as fire pump.

● The light-load protection, standard protection and heavy-load protection all have the every protection function of soft standard. The difference among them is the surges o Mot overload heat-protection. See the diagram of 6.1 and Form 6.1.

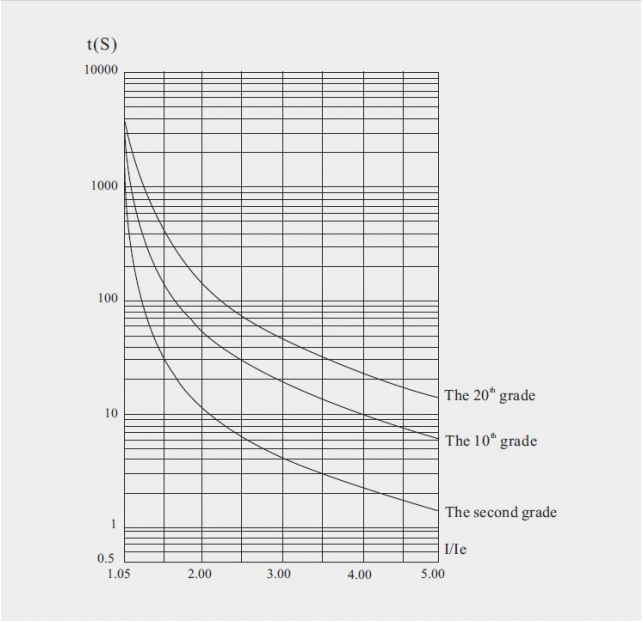
● When the motor in the best protection starting, it can be protected most perfectly.

The protection classes and the time of heat protection Form (Form 6.1)

Set explanation	Basic protection	Light-load protection	Standard protection	Heavy-load protection	The best protection	Note
The grade of overload protection	No	2 grade	10grade	20grade	10grade	Standard of IEC60947 -4-2
The grade of over-current protection	No	3 grade	15 grade	30 grade	15 grade	

Set explanation	Basic protection	Light-load protection			Standard protection			Heavy-load protection			The best protection			Note
The time of overload dropping	The multiple to the rated current	3	4	5	3	4	5	3	4	5	3	4	5	They are the typical values
	The time of dropping (S)	4.5	2.3	1.5	23	12	7.5	46	23	15	23	12	7.5	

Diagram 6.1



Motor heat protection curve diagram (Heat state)

7. Test Run and Application

Please do some examine before test running as following:

○ If the rated power of Soft Starter is matched with the Motor

○ If the Insulation of Motor is up to the requirement

○ If the Main Circuit Connection of Input or Output is correct

○ If all the screws of terminals are twisted tightly

7.1 Set up electricity to test run

● As soon as the soft starter is electrify , it displays the words of " CSZPU " or “READY ", and the Ready-lamp is light, then you can press "Run" key to start.

● Please come into FP item and input the current parameter according to the rated current on the label of Motor

● Having started the motor , you should examine whether the running direction of Motor is correct ,or whether runs normally. If not, you can press "Stop" key or cut off the power to stop running.

● If the soft starter starts badly , you can check whether the starting mode you choose is fit for your motor . Please see the detailed explanation at 7.2: the starting mode and application

● If the Moment of starting is not strong enough , you can change the starting voltage (when the starting mode is voltage control) or the limit-current value (when the mode is current control) to strength the Moment of starting .

● Do not open the up-cover in case of electricity .

● If there is any abnormal voice, smoke or taste , is very important for you to cut off electricity as soon as fast , and check the reasons .

● When the starter is in electricity or is starting , the Fault-lamp is lighting and screen displays” Err××", at this time , you had better check the Form 7.1 to get the reason .

Note : When the temperature round is less than -10℃ , the starter should be preheated for 30 minute with electricity , and then start .

Faults and Solution way (Form 7.1)

The message displayed	Explanation	Reason and the solution way
Err00	The fault is removed	Any faults are removed, such as under-voltage, over-voltage, over-heat .Now the Ready-lamp is lighting and you can start the motor
Err01	The External Instantaneous stop terminal is open	Please connect the External Instantaneous stop terminal (terminal 7) with the Public terminal (terminal 10)
Err02	The soft starter is too hot	The starter is started too frequently ,or the starter is not matched with the motor
Err03	The starting time is over long , that is longer than 60S	The starting parameter is set wrong , or the load is over and the power capacity is not enough
Err06	Three-phase unbalance	Please check the 3-phase power or the Motor is normal
Err07	Starting over current	The load is over , or the Motor is not matched with the soft starter
Err08	Running over load	The load is over , or the F6,FP item is set wrong
Err09	Under voltage	Please check the voltage of Input power , or the F7 item is set wrong
Err10	Over voltage	Please check the voltage of Input power , or the FA item is set wrong
Err11	The parameters are set wrong	Please change the parameter correctly , or you can press the "Yes" key to open the starter again to recovery the Ex-factory values

The message displayed	Explanation	Reason and the solution way
Err12	Load short-circuit	The load circuit ,or the Controlled silicon is short-circuit
Err13	The Connection of Automatic Re-start is wrong	The external terminals is not connected according the 2-wire way
Err14	The connection of external terminal is wrong	The reason is that the circuit of external stop terminal is open
Note: Some faults happened are interrelated, so please check the reasons completely.		

Note ： When the motor starts successfully , the pass-by-lamp will be lighting ，that means the pass-by contactor is running . At this time, if the contactor is not

closed, the motor will stop running, so you can check whether the connection to the pass-by contactor is right.

7.2The starting mode and application

There are six starting modes for the user to choose according the motor and load equipments, as the following:

7.2.1 Ramp voltage to start(The F9 item is set as "1" ,this starting mode is in use)

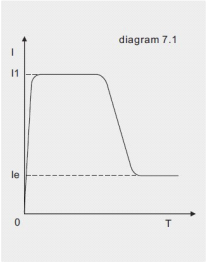


Diagram 7.1 shows the Qutput voltage waveform. In the diagram, the U1 is the initial voltage value of starting. When starting, if the motor current is not more 400% than the rated current, the Output voltage of soft starter will up to be U1, and then the Output voltage rises gradually till to the height of rated voltage (Ue). The motor runs stea dily in pace with the rising of voltage,and as soon as the voltage is up to be Ue,the motor runs tobe the rated speed and the pass-by contactor is closed,the starting operation finishes. "t" is the starting time.

Note：It is normal that When the load equipments are light, the starting time is less than the set time. This mode generally fits for the occasions where the Motor must be started smoothly

7.2.2 Current-limit to start (The F9 item is set as "0" ,this starting mode is in use)

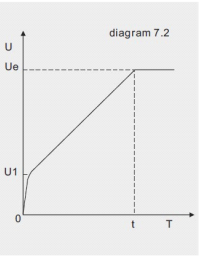


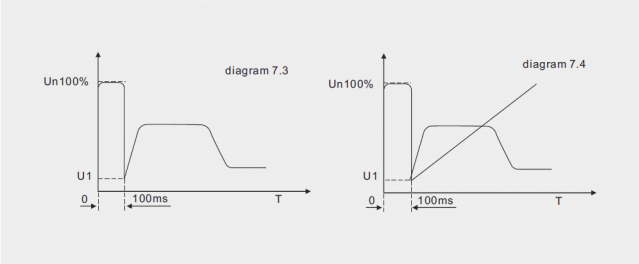
Diagram 7.2 is the changing waveform of Motor current.In the diagram,I1 is the starting limit-current value set. When starting, the output voltage rises quickly till the Motor current up to I1 value and not beyond this value.The motor runs steadily in pace with therising of output voltage,and when the motor runs to be the rated speed,the output current will have a quick-drop and down to the Motor rated current (Ie value),then the pass-by contactor is working,the stating operation finishes.

Note: It is normal that When the load equipments are light or the limit-current value youset is greater,the Max starting current is less than the limit-current value set.

This mode is often used in the conditions which requires strict limit to the current when starting.

7.2.3 Torque control to start (The F9 item is set as "2"or"3",this starting mode is

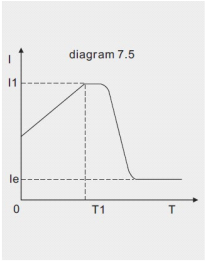
infuse) Diagrams 7.3 and 7.4 show the output changing waveform of Torque control mode. When the static friction force in the state of heavy load is too stronger to start the motor, can use this starting mode. When starting, the motor needs a very high voltage for a limited time to remove the static friction force of heavy load, then, you can use the Ramp voltage mode or limit-current mode to start the motor.



Note：This mode will cause big-current shock to the motor, so if the Ramp voltage or Limit-current mode can be used, please had better not use the Torque control to start

7.2.4 Ramp Current to start (The F9 item is set as"4", this starting mode is in use)

Diagram 7.5 shows the Output current waveform.In the diagram,I1 is the current valueset by F6 item,and T1 is Time value set by F2 item.This starting mode has very stronger speed-up ability and is suit for the Bipolar Motors, and it can reduce the starting time.



7.2.5 Double closed loop (Both Ramp Voltage and Limit-current)to start (The F9 items set as"5",this starting mode is in use) This starting mode uses the control mode of Ramp voltage starting and Limit-current starting Double Closed Loop

circuit, it is a composite starting mode. The Output voltage waveform is changed as Motor and the load equipments.

7.3 The Stopping Mode and application

The soft starter has two Stopping Modes; those are Soft-stopping mode and Free-stopping mode.

7.3.1 Soft-stopping Mode (The F2 item is not set as"0",this stopping mode is in use) When using this mode to stop the motor, the supply power to motor will be transferred from the by-Pass Contactor to the Controlled Silicon of Soft Starter, and the Output voltage of starter will be reduced gradually so that the Running Speed of Motor can be cut down smoothly in case of the Mechanical Shock. The Output Ending Voltage is the same as the initial Voltage. Soft-stopping Mode can reduce or remove the Surge of the loading equipments such as the Water Pump. You can set the Soft-stopping limit-current value through the FF item to reduce the Big-current Shock to the Motor when stopping. This limit-current value is a Percentage.

7.3.2 Free-stopping Mode (The F2 item is set as"0",this stopping mode is in use) When using this mode to stop the motor, the Soft Starter will cut off the connection to the By-pass Contactor and forbid the Controlled Silicon outputting voltage as soon as receiving the order of stopping. The motor stops gradually because of its Inertia. Generally, If the Soft-stopping Mode is not necessary, please choose the Free-stopping mode to Length the service life of the soft starter. This mode completely forbids the Instantaneous output, in case the instantaneous big-current shock to the Motor in special application state.

7.4 Application Examples

The parameters of the different loadings are different, please see the Form 7.2

The loading	Ramp voltage starting time (S)	Ramp voltage stopping time (S)	Initial voltage	Ramp voltage to start	Limit-current to start
Ball Grinding Maching	20	6	60%	4	3.5
Fan Machine	26	4	30%	4	3.5
Centrifugal Pump	16	20	40%	4	2.5
Piston Compressor	16	4	40%	4	3
Lifting Machine	16	10	60%	4	3.5
Stirring Machine	16	2	50%	4	3
Breaker	16	10	50%	4	3.5
Screw Compressor	16	2	40%	4	3
Screw Flight conveyor	20	10	40%	4	2
Light-load Motir	16	2	30%	4	3
Traveling Belt	20	10	40%	4	2.5
Heat Pump	16	20	40%	4	3

The Parameters above is for reference only.